Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech. (2009-2010 Batches) (Sem.–1,2)

ELEMENTS OF MECHANICAL ENGINEERING

Subject Code : ME-101

Paper ID : [A0123]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION - B & C. have FOUR questions each.**
3. **Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.**
4. **Select atleast TWO questions from SECTION-B & C.**

SECTION–A

1. Write briefly :

a) What do you understand by thermodynamic equilibrium?

b) What is first law of thermodynamics?

c) Distinguish between non-flow and flow processes.

d) State the Classius statement of second law of thermodynamics.

e) What is Classius inequality?

f) Draw *p-v* and *T-S* diagram for the otto cycle.

g) Define mechanical advantages and velocity ratio.

h) Differentiate between mechanism and machines.

i) What is thermal stress?

j) What is meant by hardness of a material?

SECTION–B

2. A pump forces 1.5 m^3/min of water horizontally from an open well to a closed tank where the pressure is 0.9 MPa. Calculate the work the pump must do upon the water in an hour just to force water into the tank against the pressure.

3. A gas turbine receives gases from the combustion chamber at 7 bar and 650ºC with a velocity of 90 *m/s*. The gases leave the turbine at 1 bar with a velocity of 45 *m/s*. Calculate the work done if the expansion is isentropic. Assume g = 1.333 and C_p =1.11 kJ/kg.

4. 1 kg of air having an initial volume of 0.3 m^3 is heated at constant pressure of 3.2 bar until the volume is doubled. Find

   a) heat added and

   b) work done.

   Take C_P = 1.005 kJ/Kg. K, C_v = 0.718 kJ/kg.K.

5. 4 kg of air is compressed in a reversible steady flow polytropic process, $pV^{1.25}$ = C, from 1 bar and 30ºC to 10 bar. Calculate the work input, heat transferred and change in entropy.

SECTION–C

6. Derive the expression for the ideal efficiency of Diesel cycle.

7. In a lifting machine, an effort of 30 N is required to raise a load of 1 kN. If the efficiency of the machine is 0.75, what is the velocity ratio? If on this machine an effort of 59 N raised a load of 2 kN, what is now the efficiency? What will be the effort required to raise a load of 6 kN.

8. In a differential wheel and axle, the diameter of the larger axle is 250 mm and that of the smaller 225 mm. The diameter of effort wheel is 500 mm. Find the velocity ratio. If an effort of 150 N lifts a load of 3.5 kN, what is the efficiency and effort lost in friction?

9. A steel bar of 25 mm diameter is loaded as shown in figure below. Calculate the stress in each portion and the total elongation, Take E = 200 GPa.